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Aggression, Salivary Cortisol, and Measures of Immune Competence in Goats Housed at Two Different Space Allowances

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tion), behavior, mobility, and feces linked to minimum standards. Supplementary sheets were developed to expand and quantify the primary indicators listed. The animal-based indicators were scored by the assessors via a traffic light system of green, amber, and red. If an amber or red score was recorded, follow-up action to identify the cause was undertaken to determine if there was a breach of minimum standard as per the Code of Welfare 2005 (Pigs).

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Norwegian goat farms show significant variability in pen design and space allowance. The objective of this study was to understand whether reduced space allowance leads to increased aggression and stress and whether this affects the immune competence in goats. We predicted that subordinate goats would have higher cortisol levels and lower immune responses than dominant goats, particularly when overcrowded. Pregnant Norwegian dairy goats \((n = 32)\) were housed in 8 groups of 4 animals for 6 weeks with 2 space allowances; \(0.7 \, \text{m}^2/\text{goat} \) \((n = 4)\) or \(2.2 \, \text{m}^2/\text{goat} \) \((n = 4)\).

Goats were vaccinated against paratuberculosis at the start of the trial. We monitored their cellular immune response to paratuberculosis vaccination weekly, using an interferon-gamma test. We collected saliva to measure cortisol levels at 9:00–10:00 and 13:00–14:00, 2 days a week. We videotaped goats for one 8-hr period each week and recorded continuously the number of social interactions.

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Preliminary analysis shows a tendency for more butting (p < .10), significantly more other aggressive behaviors (p < .05), and a tendency for more defensive behaviors (p < .10) in the small pens in the 1st week.

However, space allowance had no significant effects on these variables in the 2nd week. Space allowance did not have an effect on the immune response to the paratuberculosis vaccine. Five of the goats aborted as a result of a toxoplasmosis outbreak during the trial. Twenty-eight animals were toxoplasmosis seropositive in the 5th week. The impact of social stress on the toxoplasmosis outbreak could not be determined yet. The study showed the complexity of using epidemiological approaches to answer nonhuman animal welfare questions in a small, controlled trial. Ongoing data analysis measuring glucocorticoid concentration and social status of individual goats will shed further light on the hypothesis.

Considerations for Inconsistent Effects of Inadequate Environments

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The usual basic assumptions of data analysis in most nonhuman animal science and medicine studies involve normality of measures, an equality of likelihood and scale of effects across animals, and the propriety of using classical parametric analyses. These assumptions are used as they fit the training in statistics that most students have received and they also require the least number of animals to perform a study.

Many negative factors are not random in their effect upon swine populations and in fact create skewed distributions that reflect an inordinate level of detriment upon subpopulations within studies. This results in skewed distributions that, if ignored, results in underestimations of animals who are severely affected by the intervention. Moreover, particularly if growth is the major measure, mortality is correlated with severely affected animals and yet is rarely analyzed.

Multifactorial and nonparametric techniques are much more appropriate for many of these analyses. These techniques have been developed in more detail...